

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte Pranabes K. Pramanik

Appeal 2007-1947
Application 10/782,130
Technology Center 1700

Decided: 1 April 2008

Before RICHARD E. SCHAFER, SALLY G. LANE, and
JAMES T. MOORE, *Administrative Patent Judges*.

Opinion for the Board filed by *Administrative Patent Judge* SCHAFER.

DECISION ON APPEAL

1 Applicant appeals from the Final Rejection of Claims 1-13, 15, 18-33,
2 37-42, 44, and 47. 35 U.S.C. § 134(a). We have jurisdiction. 35 U.S.C. §
3 6 (b).

4 STATEMENT OF THE CASE

5 An Examiner finally rejected Claims 1-13, 15, 18-33, 37-42, 44, and
6 47 under 35 U.S.C. § 103(a) as obvious over the combined teachings of

1 Appelt¹ and Fenoglio². We affirm the rejection of Claims 1-13, 15, and 18-
2 33 but reverse the rejection of Claims 37-42, 44, and 47.

3 FINDINGS OF FACT

4 **Claimed Subject Matter**

5 F. 1. The claimed subject matter pertains to a multilayered construction
6 suitable for forming capacitors in electronic devices. Spec., p. 1, ll. 11-
7 13, and p. 3, ll. 25 and 26.

8 F. 2. Applicant's Figure 1, reproduced below, shows an embodiment of the
9 claimed multilayered construction:

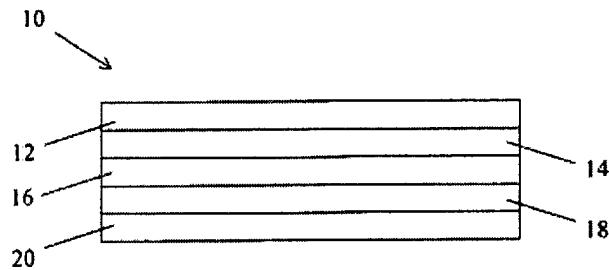


FIG. 1

10 F. 3. The multilayered construction 10 includes electrically conductive
11 layers 12 and 20, and inner dielectric layers 14, 16, and 18. Spec., p. 6,
12 ll. 7-19.

13 F. 4. The conductive layers 12 and 20 may be copper. Spec., p. 8, ll. 2
14 and 3.

15 F. 5. The dielectric layers 14 and 18 are made of thermosetting polymer,
16 preferably an epoxy resin. Spec., p. 1, ll. 13-16; and p. 3, ll. 5-8.

17 F. 6. The claims present two embodiments which differ in the nature of the
18 central layer 16.

¹ US 2001/0005304, published June 28, 2001.

² US 5,003,037, published March 26, 1991

1 F. 7. In the first embodiment, represented by Claim 1, the central layer 16
2 is a specified polymer. Spec., p. 12, ll. 8-13 and 23-26; and p. 13, ll. 1-4.

3 F. 8. The polymer is an aromatic polyamide, polyethylene terephthalate, a
4 polyethylene naphthalate, a polyvinyl carbazole, a polyphenylene sulfide,
5 a polyether-nitrile, a polyether-ether-ketone, or their mixtures. App. Br.,
6 p. 11, Claim 1; and Spec., p. 12, ll. 18-23.

7 F. 9. In the second embodiment, represented by Claim 37, the central layer
8 16 is a polymer precursor. App. Br., p. 15, Claim 37; and Spec., p. 12, ll.
9 8-11.

10 F. 10. The precursor is a monomer or oligomer of the same polymers listed
11 in F. 7. App. Br., p. 15, Claim 37; Spec., p. 12, ll. 13-17.

12 F. 11. Claim 1 provides³:

13 1. A multilayered construction suitable for forming capacitors
14 which is formed by a process which comprises:
15

16 a) applying a first thermosetting polymer layer onto a surface of a first
17 electrically conductive layer;
18

19 b) applying a central polymerizable layer onto a surface of the first
20 thermosetting polymer layer, which central polymerizable layer
21 comprises a polymerizable precursor of a polyethylene terephthalate,
22 a polyethylene naphthalate, a polyvinyl carbazole, a polyphenylene
23 sulfide, an aromatic polyamide, a polyether-nitrile, a polyether-ether-
24 ketone, or combinations thereof;
25

26 c) applying a second thermosetting polymer layer onto a surface of a
27 second electrically conductive layer; thereafter
28

³ Throughout this decision, we refer to the Substitute Appeal Brief filed on September 5, 2006. All references to the claims are to the copy appearing the Claims Appendix submitted with that Brief. The Examiner has certified the copy to be correct. Ans., p. 3.

d) attaching the first electrically conductive layer to the second electrically conductive layer such that each of the first and second thermosetting polymer layers and the central polymerizable layer are positioned between the first and second electrically conductive layers; and thereafter

e) polymerizing said polymerizable layer;
wherein each of said first thermosetting polymer layer, said second thermosetting polymer layer and said central polymerizable layer optionally further comprises a filler material.

App. Br., p. 11.

F. 12. Claim 37 provides:

37. A multilayered construction suitable for forming capacitors which comprises:

a) a first electrically conductive layer, having first and second surfaces;

b) a first thermosetting polymer layer, having first and second surfaces, on the first electrically conductive layer with the first surface of the first thermosetting polymer layer on the second surface of the first electrically conductive layer;

c) a central polymerizable layer, having first and second surfaces, on the first thermosetting polymer layer with the first surface of the central polymerizable layer on the second surface of the first thermosetting polymer layer, which central polymerizable layer comprises a polymerizable precursor of a polyethylene terephthalate, a polyethylene naphthalate, a polyvinyl carbazole, a polyphenylene sulfide, an aromatic polyamide, a polyether-nitrile, a polyether-ether-ketone, or combinations thereof;

d) a second thermosetting polymer layer, having first and second surfaces, on the central polymerizable layer with the first surface of the second thermosetting polymer layer on the second surface of the second surface of the central polymerizable layer; and

e) a second electrically conductive layer, having first and second surfaces, on the second thermosetting polymer layer with the first surface of the second electrically conductive layer on the second surface of the second thermosetting polymer layer;

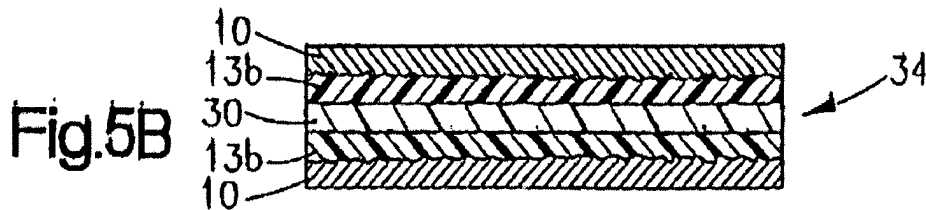
wherein each of said first thermosetting polymer layer, said second thermosetting polymer layer and said central polymerizable layer optionally further comprises a filler material.

App. Br., p. 15.

Appelt

F. 13. Appelt teaches a multilayered construction suitable for forming capacitors in electronic devices. Appelt, Abstract.

F. 14. Appelt's Figure 5B, reproduced below, shows a multilayered capacitor 34:



F. 15. The capacitor 34 includes first and second electrically conductive layers 10 and first and second dielectric layers 13b and central dielectric layer 30. Appelt, ¶ 0028.

F. 16. The electrically conductive layers 10 may be copper. Appelt, ¶ 0006.

F. 17. The first and second dielectric layers 13b are an epoxy polymer. Appelt, ¶ 0028.

F. 18. The central layer 30 is a polyimide. Appelt, ¶ 0028.

1 F. 19. Appelt teaches making the capacitor beginning with a central polymer
2 layer, i.e., polyimide sheet 30, adding first and second thermosetting
3 epoxy polymer layers 13b to each side, followed by bonding of the
4 electrically conductive copper layers 10 to the epoxy layers. Appelt, ¶
5 0028.

6 F. 20. Appelt does not teach a central polymer layer of an aromatic
7 polyamide or any of the other polymers required by Claim 1.

8 F. 21. Appelt also does not teach an unpolymerized precursor as the central
9 layer required by Claim 37.

10 **Fenoglio**

11 F. 22. Fenoglio teaches that aromatic polyamides, polyimides, polyamide-
12 imides, and their mixtures are used extensively in the electronics industry
13 as dielectric materials for interlevel dielectrics, electrical component
14 substrates, protective coatings, and insulating coatings and films.

15 Fenoglio, Abstract, and col. 1, ll. 22-31 and 59; and col. 2, ll. 11-47.

16 F. 23. Based on Fenoglio's teachings, one of ordinary skill in the art would
17 have recognized the interchangeability of aromatic polyamides,
18 polyimides, polyamide-imides, and their mixtures as dielectric materials
19 in electrical components.

20 **ISSUES**

21 The Examiner contends that the subject matter of Claims 1-13, 15, 18-
22 33, 37-42, 44, and 47 would have been obvious over the combined teachings
23 Appelt and Fenoglio. Ans., pp. 3-5. The Examiner finds that Appelt teaches
24 a multilayered construction suitable for forming capacitors. Ans., pp. 3 and
25 4. The Examiner further finds that Fenoglio teaches the "functional
26 equivalence" of polyamides, polyimides, and polyamide-imides as

1 dielectrics and that one skilled the art would have had reason to utilize any
2 of them as the central dielectric layer in Appelt's capacitor. Ans., p. 7. The
3 Examiner concludes that it would have been obvious to substitute the
4 polymers taught by Fenoglio for Appelt's polyimide central layer. Ans., p.
5 4.

6 Applicant contends that it would not have been obvious to substitute
7 the central layer of Appelt with the polyamide-imide taught by Fenoglio.
8 App. Br., pp. 6-10. Applicant further contends that neither Appelt nor
9 Fenoglio teaches the use of a polymer precursor as the central layer. App.
10 Br., pp. 8 and 9.

11 The overall issue is whether Applicant has shown that the Examiner
12 erred in rejecting the subject matter of the claims as obvious over the
13 combined teachings of Appelt and Fenoglio. This issue breaks into two
14 subsidiary issues: (1) with respect to Claims 1-13, 15, and 18-33, whether it
15 would have been obvious to substitute Fenoglio's aromatic polyamide
16 dielectric for Appelt's polyimide dielectric and (2) with respect to Claims
17 37-42, 44, and 47, whether it would have been obvious to substitute an
18 *unpolymerized* central layer for Appelt's central polymer layer.

19 ANALYSIS

20 Applicant defines his invention in terms of the two independent
21 claims, Claims 1 and 37, and a number of dependent claims. Applicant has
22 not presented separate arguments for any of the dependent claims. Those
23 claims therefore stand or fall with their respective independent claims.
24 While Applicant has not provided separate arguments as to Claims 1 and 37,
25 for reasons which appear below, we address Claims 1 and 37 separately.

The claimed subject matter pertains to a multilayered construction suitable for forming capacitors. Spec., p. 1, ll. 11-13, and p. 3, ll. 25 and 26. Applicant's Figure 1, reproduced below, shows a schematic representation of a multilayered capacitor according to Applicant's invention:

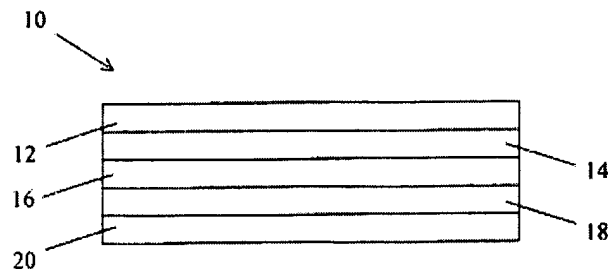


FIG. 1

Referring to Figure 1, the multilayered capacitor 10 includes electrically conductive layers 12 and 20 separated by inner layers 14, 16, and 18. Spec., p. 6, ll. 7-19. The electrically conductive layers 12 and 20 may be copper. Spec., p. 8, ll. 2 and 3. The inner layers 14, 16, and 18 are dielectric. Spec., p. 1, ll. 13-16 and 22-24; and p. 3, ll. 12-22. Inner layers 14 and 18 are thermosetting polymers, preferably an epoxy. Spec., p. 1, ll. 13-16 and 22-24; p. 3, ll. 9-22; and p. 11, ll. 2 and 3. The subject matter of Claims 1 and 37 differ in the nature of the central layer 16. In Claim 1 the central layer is made of certain specified polymers. In Claim 37 the central layer is an unpolymerized polymer precursor.

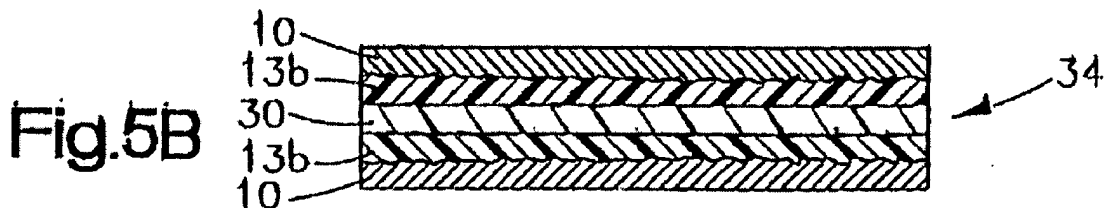
Claim 1

In Claim 1, Applicant has chosen to describe the invention in terms of the process of making it. Thus the claim begins: "A multilayered construction suitable for forming capacitors *which is formed by a process which comprises...*" App. Br., p. 11 (Italics added). Patentability of such "product-by-process" claims depends on the structure and characteristics of

1 the resulting product itself, not on the process steps. *SmithKline Beecham*
2 *Corp. v. Apotex Corp.*, 439 F.3d 1312, 1317 (Fed. Cir. 2006); *In re Thorpe*,
3 777 F. 2d 695, 697 (Fed. Cir. 1985). Where the structure and characteristics
4 of the claimed product is the same as or would have been the obvious from
5 the structure and characteristics of the prior art product, the burden shifts to
6 the Applicant to show an unobvious difference for the claimed product.
7 *Thorpe*, 777 F. 2d at 698. Thus, in deciding the patentability of the subject
8 matter of Claim 1, we compare the structure and characteristics of the
9 multilayered capacitor of Claim 1 with the structure and characteristics of
10 the capacitor described by Appelt.

11 The process of making the “multilayered” structure includes the steps
12 of applying a polymerizable layer of specified polymer precursors to a
13 thermosetting layer (Step b) and polymerizing (Step e). Thus, the subject
14 matter of Claim 1 is a multilayered structure having electrically conductive
15 layers 12 and 20, thermosetting polymer layers 14, and 18, and a central
16 layer 16 of specified polymers .

17 Appelt teaches a multilayered capacitor. Appelt, Abstract. Appelt’s
18 Figure 5B shows an embodiment which is reproduced below:



19 Figure 5B shows a side-view of a capacitor 34 having first and second outer
20 electrically conductive layers 10, first and second inner epoxy polymer
21 layers 13b, and a central polymer layer 30 of polyimide. Appelt, ¶ 0028.

1 Appelt does not teach the use of any of the central layer polymers
2 required by Claim 1.

3 Fenoglio relates to certain aromatic polyamides, polyimides and
4 polyamide-imides and their uses. Specifically, Fenoglio teaches that
5 aromatic polyamides, polyimides and polyamide-imides have found
6 extensive use as dielectrics. Fenoglio, col. 1, ll. 22-26. Fenoglio also says
7 these polymers have been used both as interlevel dielectrics and as coatings
8 and films for insulating coatings. Fenoglio, col. 1, ll. 28-31 and 2, ll. 11-47.
9 One having ordinary skill in the art would have recognized the
10 interchangeability of aromatic polyamides, polyimides and polyamide-
11 imides polymers as dielectrics. In view of the interchangeability, it would
12 have been obvious to substitute an aromatic polyamide for the polyimide
13 central dielectric layer in the capacitor described by Appelt.

14 Applicant argues that it would not have been obvious to substitute the
15 polyamide-imide polymer taught by Fenoglio for Appelt's polyimide central
16 layer. App. Br., pp. 6-10. Fenoglio's teachings, however, are not limited to
17 polyamide-imide dielectrics. Fenoglio also teaches the use of aromatic
18 polyamides as dielectrics. Fenoglio, Abstract; col. 1, ll. 22 and 59; and col.
19 2, ll. 11-47. One skilled in the art would have recognized that the aromatic
20 polyamide dielectric taught by Fenoglio could have been substituted for the
21 polyimide as the central layer of the capacitors taught by Appelt. In view of
22 this teaching of the interchangeability of polyimides, aromatic polyamides
23 and polyamide-imides, it would have been at least obvious to try substituting
24 an aromatic polyamide for Appelt's polyimide. *KSR Int'l Co. v. Teleflex*
25 *Inc.*, 127 S. Ct. 1727, 1742 (2007). Further, in light of the interchangeability
26 of the polymers, one skilled in the art would also have had a reasonable

1 expectation that Fenoglio's aromatic polyamides would be work as the
2 central dielectric layer in Appelt's capacitor. Obviousness requires only a
3 reasonable expectation of success. *In re O'Farrell* 853 F.2d 894, 904 (Fed.
4 Cir. 1988).

5 Applicant argues that neither Appelt nor Fenoglio teaches the use of
6 the polymerizable precursor as the central layer. App. Br., p. 8. However,
7 the product of Claim 1 does not require a polymerizable precursor. Rather,
8 the product of Claim 1 requires a central polymerized layer. See Claim 1,
9 paragraph e); and Spec. p. 12, ll. 18-26. Applicant has not directed us to
10 evidence of an unobvious difference in structure and characteristics between
11 the subject matter of Claim 1 and the capacitor taught by Appelt.

12 Applicant also refers us to the proceedings in PCT application
13 PCT/US2005/001820, in which it is said that the same Examiner found
14 "identical" claims to have novelty and an inventive step on an identical
15 record. App. Br., pp. 5-6. Applicant contends that the present rejection
16 "shows an inconsistency in reasoning" with the PCT determination and
17 "should be overruled". App. Br., p. 6.

18 Applicant appears to be arguing that the Examiner is estopped from
19 reaching a legal conclusion contrary to that arrived at in PCT case.
20 However, assuming without deciding that the claims and records are
21 identical, Applicant has provided no authority holding that the principles of
22 estoppel apply against the Office in these circumstances. In any event,
23 Applicant has not refuted the Examiner's argument that the U.S. and PCT
24 legal standards are different. Ans., p. 8.

25 The rejection of Claims 1-13, 15, and 18-33 is affirmed.

Claim 37

The subject matter of Claim 37 also involves a multilayered construction suitable for use as a capacitor. Claim 37 differs from Claim 1 in requiring a central unpolymerized layer. Compare App. Br., pp. 11 and 15. Appelt's multilayered capacitor includes a central polymer layer.

The Examiner has not presented a rationale or directed us to any disclosure in the prior art that provides a reason for substituting an unpolymerized precursor for Appelt's central polymer layer. "[T]here must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness". *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006). Neither Appelt nor Fenoglio teaches an unpolymerized precursor for the central layer.

If anything, Appelt appears to "teach away" from the use of an unpolymerized precursor. Appelt teaches forming a capacitor by laminating the thermosetting material and metallic layers to both sides of a preformed polymer sheet. The preformed polymer sheet becomes the central layer of the capacitor. Appelt, ¶ 0028. The substitution of an unpolymerized precursor for Appelt's polymer would appear to make that process inoperative. Based upon the art relied upon there would be no reason to substitute an unpolymerized precursor for Appelt's preformed polymer.

The rejection of Claims 37-42, 44, and 47 is reversed.

CONCLUSIONS OF LAW

On the record before us, Applicant has not sustained the burden of establishing that that Examiner erred in holding that the subject matter of Claims 1-13, 15, and 18-33 would have been obvious within the meaning of 35 U.S.C. § 103(a).

However, Applicant has sustained its burden of establishing that that Examiner erred in holding that the subject matter of Claims 37-42, 44, and 47 would have been obvious within the meaning of 35 U.S.C. § 103(a).

DECISION

The decision of the Examiner rejecting the subject matter of Claims 1-13, 15, and 18-33 under 35 U.S.C. § 103(a) is affirmed.

The decision of the Examiner rejecting the subject matter of Claims 37-42, 44, and 47 under 35 U.S.C. § 103(a) is reversed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED-IN-PART

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The time period for reply, if any, is set in the attached communication.